Why AM Radio Stations Must Reduce Power, Change Operations, or Cease Broadcasting at Night

Most AM radio stations are required by the FCC's rules to reduce their power or cease operating at night in order to avoid interference to other AM stations. FCC rules governing the daytime and nighttime operation of AM radio stations are a consequence of the laws of physics. Because of the way in which the relatively long wavelengths (see Footnote 1) of AM radio signals interact with the ionized layers of the ionosphere miles above the earth's surface, the propagation of AM radio waves changes drastically from daytime to nighttime. This change in AM radio propagation occurs at sunset due to radical shifts in the ionospheric layers, which persist throughout the night. During daytime hours when ionospheric reflection does not occur to any great degree, AM signals travel principally by conduction over the surface of the earth. This is known as "groundwave" propagation. Useful daytime AM service is generally limited to a radius of no more than about 100 miles (162 km), even for the most powerful stations.

However, during nighttime hours the AM signals can travel over hundreds of miles by reflection from the ionosphere, a phenomenon called "skywave" propagation. (Shortwave stations, which operate using AM modulation on several bands between between 2.3 MHz and 26.1 MHz, also use this phenomenon to broadcast still greater distances, up to thousands of miles.) Because of this change in signal propagation from daytime to nighttime, if every AM station kept its daytime operating power at night, massive interference would result. (For a similar description, *see Hours of Daytime-Only AM Broadcast Stations*, First Report and Order, BC Docket 82-538, 95 FCC 2d 1032 (1983) [PDF] and related [MO&O]).

The FCC was established by the Communications Act of 1934, and was given the responsibility of making a "fair, efficient and equitible distribution of radio service" to the various communities of the United States. In order to meet this responsibility, and in recognition of the physical laws that govern AM radio propagation, the FCC established three basic classes of AM stations (Clear Channel, Regional, and Local), each of which operates on specified frequencies, or channels.

For the most part, the basic structure of the FCC's original frequency plan has remained unchanged over the past several decades. Additional stations gradually have been permitted to operate on the clear channels where daytime interference would not exist. In order to preserve the wide-area nighttime service provided by the dominant clear

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channel stations, when nighttime operation is permitted, many of these stations are required to use directional antennas in order to protect the dominant clear channel station from interference to its nighttime skywave service area. Most of these stations are also required to reduce power at night, to avoid causing interference to the dominant stations and to each other. Other stations, which cannot provide the necessary protection at night to other AM stations, are presently licensed to operate during the daytime hours only. (Daytime-only stations are no longer being authorized, as of December 1, 1987.)

To find out what daytime and nighttime operations are authorized for your favorite AM broadcast station, you may use our AM Query. The *Hours of Operation for this Record* field for the station will indicate what hours the station may operate with the listed station parameters, either as *Unlimited hours operation, Daytime, or Nighttime*. If the record shows the "Hours of Operation" as "Daytime" or "Nighttime," then you can find the approximate monthly times that the station will change from day to night operation (or cease operation for the night in the case of a daytime-only station) by entering the coordinates (latitude and longitude) into the Sunrise/Sunset Times Calculations program. Note that a station may have multiple records for different daytime and nighttime operations.

Footnotes:

Footnote 1: The wavelengths of AM radio signals vary from a maximum of 555 meters (1821 feet) at 540 kilohertz (kHz), the lowest AM carrier frequency used in the United States for broadcast stations, to a minimum of 176 meters (579 feet) at 1700 kHz, the highest carrier frequency at the upper end of the AM expanded band. In contrast, the wavelengths of FM radio signals are much shorter. i.e., approximately 3 meters (10 feet). Because of their much shorter wavelengths, FM signals are not significantly reflected by the ionosphere.

Footnote 2: This is somewhat of an oversimplification, in that there are actually two classes of clear channels. On some of the clear channels, there are two dominant stations, which are separated by great distances and which employ directional antennas during nighttime hours in order to protect each other's skywave service areas.

For more information about this issue, please call the Audio Division at (202) 418-2700.

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